

CHAPTER 2

DISTRIBUTION SYSTEMS

2-1. Direct-pressure systems. A direct-pressure distribution system is one in which no elevated storage is provided, and the required distribution pressures are maintained only by pumping facilities. Direct-pressure distribution systems will be considered only where the use of special requirements will not permit the utilization of other systems. The pumping facilities in a direct-pressure system must have firm capacities equal to or greater than the peak demand rates exerted on the system. The firm capacity of a pumping facility is the total pumping capacity with the largest pump out of service. Direct-pressure systems could waste energy and should not normally be used in mobilization construction.

2-2. Gravity-pressure systems. A gravity-pressure distribution system, one in which elevated storage facilities are provided to maintain pressure levels, will be used at mobilization sites. The use of elevated storage facilities will reduce the size of pipes needed in the distribution system as well as the number and size of pumps needed for water distribution. Since partial supply can be maintained for a period of time even while distribution pumps are out of service, the provision of elevated storage also increases system reliability. In addition, gravity systems do not require the control features or special equipment for direct pressure or pneumatic systems.

2-3. Pneumatic systems.

a. Pneumatic water supply systems are used for boosting water from a low pressure source to a higher pressure, stabilizing a variable pressure supply within acceptable limits, and minimizing frequency of pump cycles. Hydropneumatic distribution systems are applicable where demands are less than 500 gpm.

b. The low pressure setting on the hydropneumatic tank is determined by distribution system requirements. The recommended minimum operating pressure is 30 psi. The high pressure setting on the hydropneumatic tank is dependent on the maximum allowable pressure in the distribution system. The recommended maximum operating pressure is 120 psi. For a specific application, the pressure variation in the tank is normally about 20 psi. The low water level (water level at the low pressure setting) must be high enough to provide a water seal. At the low water level, the water remaining in the tank should be at least 10 percent of the capacity of the tank. The high water level should be calculated to provide maximum possible efficiency. The pump(s) will be sized to deliver 125 percent of the calculated peak demand of the distribution system. The tank size will be sufficient for at least 10 minutes of pumping time at the rated capacity of the pump. The tank will be sized so that the pump cycles not less than 4 times per hour,

or more than 10 times per hour, unless the pump motor horsepower rating exceeds 50, in which case the maximum number of cycles will be 6 per hour. Completely automatic hydropneumatic tank controls are available to maintain proper operating conditions (correct air-water volume ratios) during each pump cycle. An auxiliary air compressor-type air charging system will be used for tanks larger than 750 gallons and pressures higher than 75 psi. An air volume control valve operation will be used to maintain correct air-water volume ratios for all other applications.

2-4. Dual water supplies. Dual water supply systems consist of independent pipe networks supplying two grades of water to users. The higher quality water is used for domestic purposes such as drinking, cooking, dishwashing, laundry, cleaning, and bathing; the lower quality water may be used for toilet flushing, fire fighting, lawn and garden watering, and commercial or industrial uses not requiring high quality water. Dual water supply systems are not feasible except under unusual circumstances. A dual water supply might be utilized when the only available water supply is brackish and the cost of a dual system is less than the demineralization cost of all the water supplied to users, or when only a limited quantity of higher quality water is available, and it is more economical to construct a dual system than to implement the required treatment of the lower quality water. If a dual water supply system is established and the lower quality water use might result in human contact or ingestion (e.g., toilet flushing and lawn and garden watering), both water supplies must be disinfected.

2-5. Recycling used water. There are operations that generate effluent water that can be reused for the same operation after minimal treatment. This does not constitute a dual system. Examples of such effluents are laundry wastes, vehicle washrack waste water, and plating operations waste water. Recycling of such water should be practiced wherever feasible.